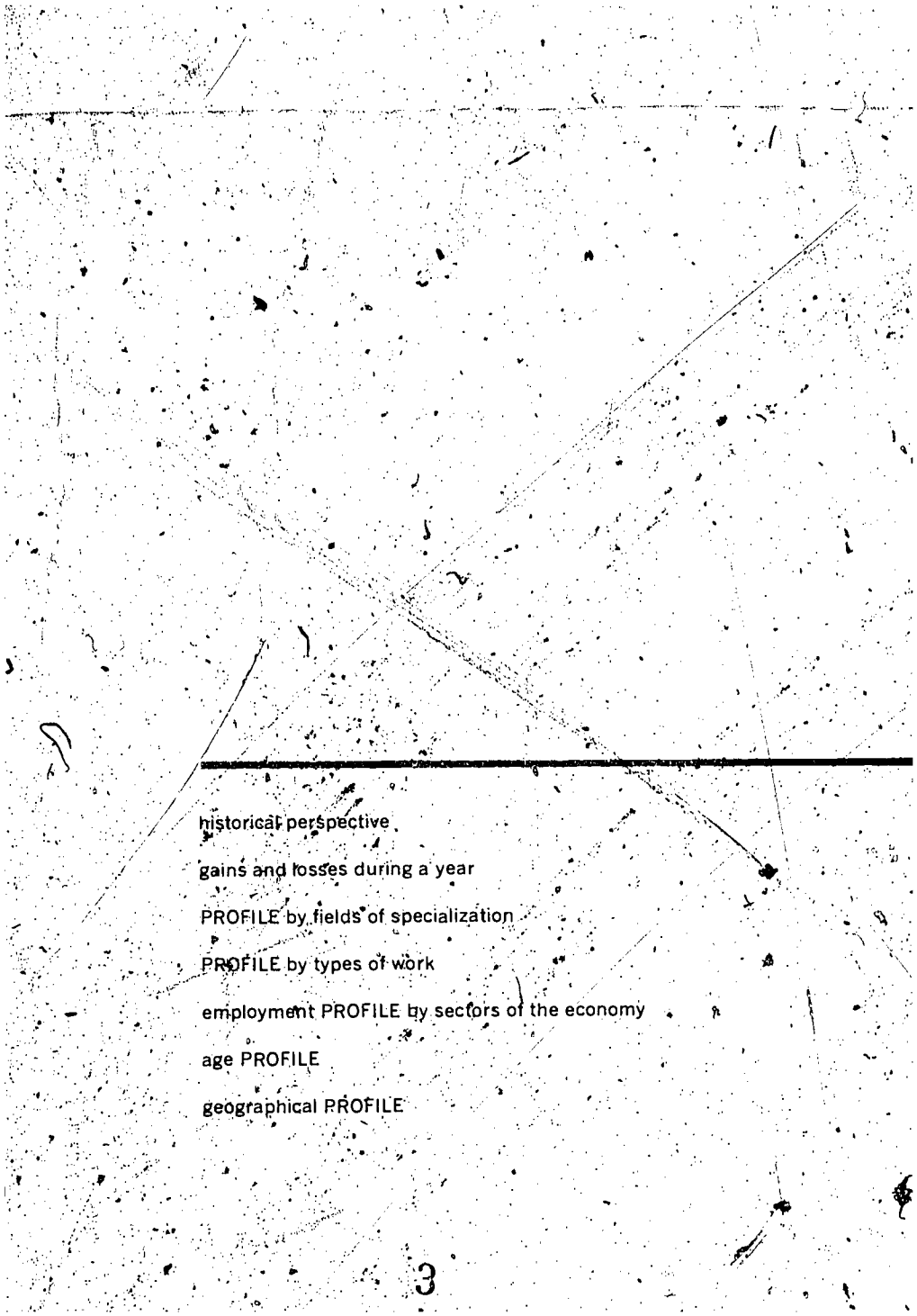
DOCUMENT RESUME

ED 161 713 SE 025 175

TITLE	Profiles of Manpower in Science and Technology.
INSTITUTION	National Science Foundation, Washington, D.C.
REPORT NO	NSF-63-23
PUB DATE	63
NOTE	39p.; Colored and shaded charts and graphs will not reproduce well
EDRS PRICE	MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS	*Employment; *Engineers; Science Education; *Science Teachers; *Scientific Manpower; Scientists; *Statistical Surveys; Technology
IDENTIFIERS	National Science Foundation

ABSTRACT

This National Science Foundation (NSF) publication of 1963 contains statistical descriptions of the one-half million persons working as scientists, one million engineers, one million technicians, and one-quarter million teachers of science and mathematics in secondary schools. Employment profiles by sectors of the economy are provided. (CP)


historical perspective
gains and losses during a year
PROFILE by fields of specialization
PROFILE by types of work
employment PROFILE by sectors of the economy
age PROFILE
geographical PROFILE

PROFILES OF MANPOWER IN SCIENCE AND TECHNOLOGY

National Science Foundation, Washington, D. C. • 1963

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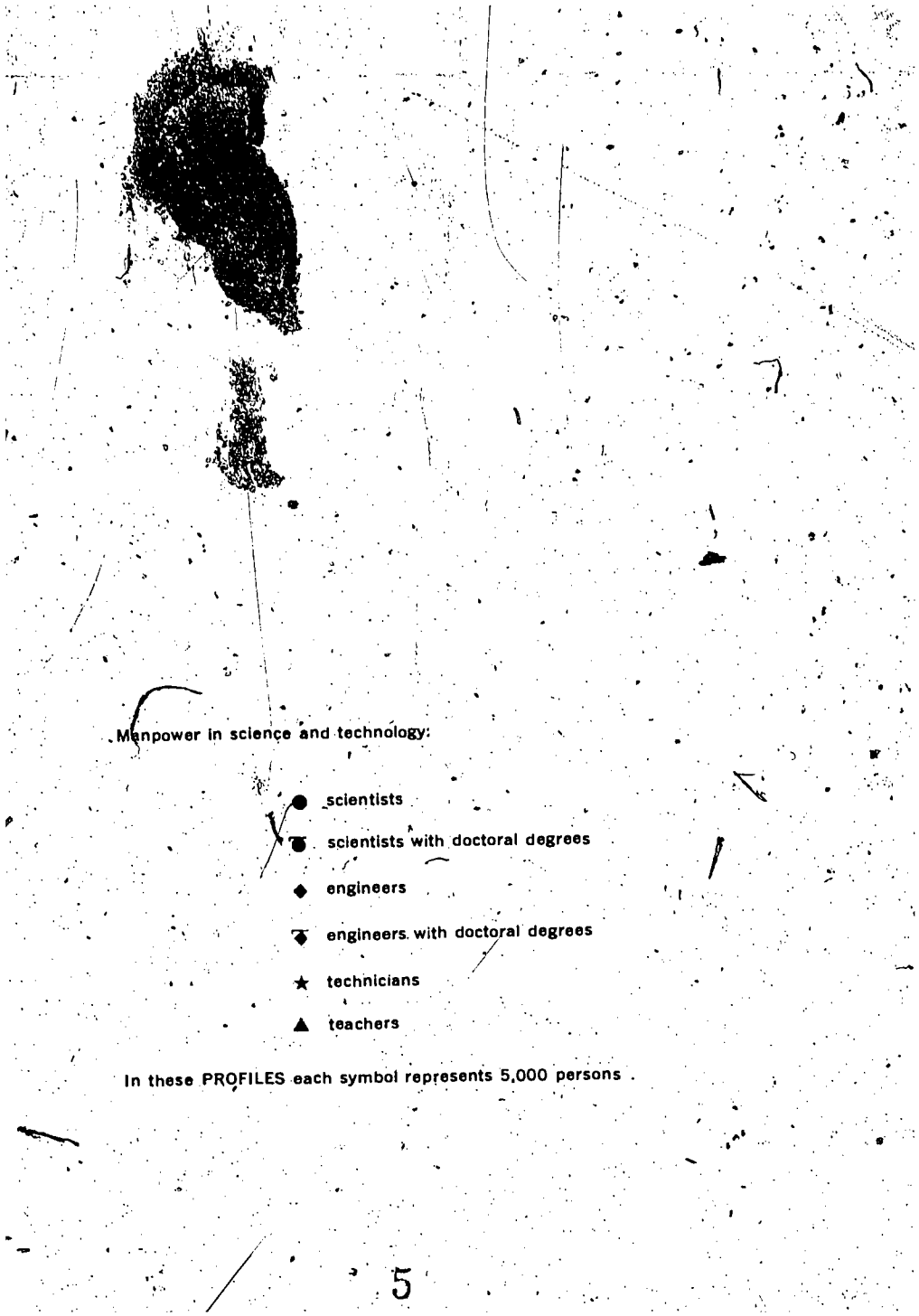

Manpower in science and technology:
scientists
scientists with doctoral degrees
engineers
engineers with doctoral degrees
technicians
teachers
In these PROFILES each symbol represents 5,000 persons .

ABOUT THIS BOOK

Today in the USA about one-half million persons are working as scientists, nearly one million as engineers, one million as technicians, and one-quarter million as teachers of science and mathematics in secondary schools.

This book contains some statistical information concerning these four categories of persons. As viewed here, they make up the Nation's specialized manpower employed in science and technology.

The nearly two and three-quarter million specialists working in science and technology in 1963 account for approximately 3.6 percent of the civilian labor force. The figure was about 1.5 percent in 1940 and is expected to reach 4.7 percent in 1970.

These persons serve the Nation in many ways: some of them expand scientific knowledge by doing research; some apply scientific information and engineering techniques to develop new products and services, or to solve problems in health, defense, or transportation; some operate complex systems for communication or for the exploration of space; and some educate and train manpower.

The Nation's manpower in science and technology finds employment in each sector of the Nation, in colleges and universities, in industry, in Federal, State, and local governments, and in other organizations.

The numbers of persons who do each type of work and the numbers employed in each sector are depicted by tables and charts in this book. Also shown statistically are such characteristics of the manpower as its distribution by age, by field of specialization, and by geographical location.

Thus the book offers statistical PROFILES of manpower in science and technology.

Only an individual person—not manpower in the mass—makes a discovery, conceives a product, or inspires a student. Statistics can not measure the quality of contributions such as these. Statistical information can, however, provide guidance essential for making policies and plans to ensure opportunities for individual contributions to be made in future years.

Policy makers in many organizations, both private and public, including executive and legislative bodies, increasingly need facts that bear upon the Nation's enlarging investment of people in science and technology.

These PROFILES bring to the policy maker a new pattern of comprehensiveness—a unified overview of manpower in science and technology. Approximate figures, based upon data from many sources, portray a self-consistent set of national totals rather than precise counts of particular segments of manpower. Compiled expressly for this book, the figures do not necessarily agree in detail with figures published elsewhere, as in documents cited in the bibliography.

DEFINITIONS:

All numbers in this book refer to persons "working as" scientists, engineers, technicians, or teachers. In the statistics of manpower, persons "trained as" are defined quite differently and are counted by numbers of academic degrees awarded in relevant fields. Some persons holding such degrees are not working in science and technology—and some persons counted in these PROFILES do not hold such degrees.

All counts include women, who now compose about twelve percent of the scientists, one percent of the engineers, seventeen percent of the technicians, and thirty percent of the teachers of science and mathematics in secondary schools.

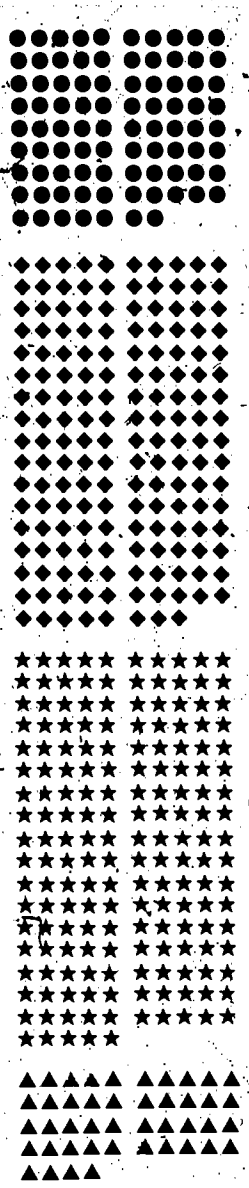
Degree of accuracy in this book is suggested by the number of digits, sometimes only one or two, used to express each quantity. Most of the figures are believed to be correct within ten percent. Sources of inaccuracy include the approximations made in adapting and extrapolating available data, and the shifting patterns of flow of persons into and out of the several categories of manpower depicted.

Further definitions and interpretive comments accompany the PROFILES.

HISTORICAL PERSPECTIVE

The Nation's total manpower working as scientists, engineers, technicians, and teachers of science and mathematics in secondary schools has increased faster for several decades than has either the population or the labor force.

USA population has increased at an average annual rate of about one and one-half percent since 1940. The average rate of increase for manpower in science and technology has been about five percent.



Manpower in science and technology, 1960

USA POPULATION

LABOR FORCE

MANPOWER IN SCIENCE AND TECHNOLOGY

SCIENTISTS

ENGINEERS

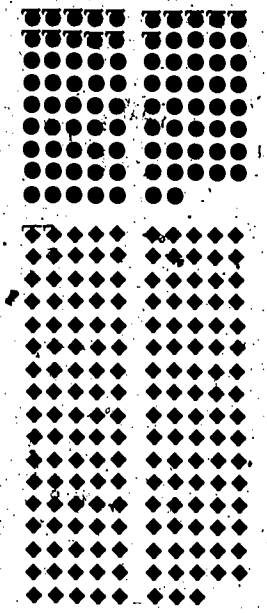
TECHNICIANS

TEACHERS OF SCIENCE AND MATHEMATICS IN SECONDARY SCHOOLS

The table highlights these trends and includes figures for main categories of manpower described in this book. Within the specialized manpower employed in science and technology, about one person in six is working as a natural or social scientist; about one in three as an engineer. Together they comprise about 1.9 percent of the civilian labor force.

Estimates shown for 1970 represent neither a forecast of supply nor a statement of future need. Developed specifically for these PROFILES, they are projections based upon current trends in employment in relevant fields, and upon the assumption of no substantial changes in economic and political conditions.

1940	1950	1960	1963 estimate	1970 estimate
millions				
132.0	152.3	180.7	190	209
56.2	64.7	73.1	76	86
0.86	1.47	2.37	2.7	4.0
[redacted]				
thousands				
145	245	435	500	740
300	545	840	935	1,400
300	550	875	1,000	1,600
110	130	220	250	300



HISTORICAL PERSPECTIVE, continued

PHYSICAL SCIENTISTS, MATHEMATICIANS

LIFE SCIENTISTS INCLUDING PSYCHOLOGISTS

SOCIAL SCIENTISTS

CIVIL ENGINEERS

ELECTRICAL ENGINEERS

MECHANICAL, AERONAUTICAL AND ASTRONAUTICAL ENGINEERS

INDUSTRIAL, CHEMICAL, AND OTHER ENGINEERS

ALL SCIENTISTS AND ENGINEERS

DOCTORAL SCIENTISTS AND ENGINEERS

DOCTORAL SCIENTISTS

DOCTORAL ENGINEERS

As counted in these PROFILES, scientists and engineers are persons engaged in scientific or engineering work requiring knowledge and training equivalent at least to that acquired in a four-year college course in a field relevant to that work.

thousands

1940	1950	1960	1963 estimate	1970 estimate
65	120	225	255	390
50	80	140	160	235
30	45	70	85	115
80	135	160	170	240
50	110	180	220	325
75	130	210	240	370
95	170	290	305	465
445	790	1,275	1,435	2,140
28	45	89.2	106	170
27.5	43.5	81.7	96	153
0.5	1.5	7.5	10	17

Fields of science are defined to cover mathematics, physical sciences, life sciences including psychology, and social sciences except for history.

Because persons who hold doctoral degrees such as Ph.D. or Sc.D. in many ways provide leadership in science and technology, holders of these degrees are singled out in separate figures, totaled here.

GAINS AND LOSSES DURING A YEAR

START YEAR

GAINS

Persons entering science with a degree in science, or entering engineering with a degree in engineering

Persons entering science with a degree not in science, or entering engineering with a degree not in engineering

Persons entering science or engineering without a bachelor's degree

Immigration

LOSSES

Deaths and retirements

Persons transferring from science or engineering into work that is neither

NET CHANGE

NET CHANGE

PERCENT NET CHANGE

END YEAR

Estimated gains and losses in manpower during a period of twelve months provide a model to illustrate dynamics of change in the scientific and technological working force.

thousands

SCIENTISTS	ENGINEERS	TECHNICIANS	TEACHERS*	ALL
480	900	955	240	2,575
+ 27	+ 52	+ 60	+ 35	+ 174
− 7	− 17	− 15	− 25	− 64
+ 20	+ 35	+ 45	+ 10	+ 110
+ 4.2%	+ 3.9%	+ 4.7%	+ 4.2%	+ 4.3%
500	935	1,000	250	2,685

* *teachers of science and mathematics in secondary schools*

thousands

SCIENTISTS	ENGINEERS
+ 22	+ 31
+ 3	+ 8
+ 1	+ 10
+ 1	+ 3
− 5	− 12
− 2	− 5
+ 20	+ 35

Figures given here are estimated from trends and statistical samples and are adjusted to match the 1963 estimates given in the preceding historical perspective.

The percent net change, now about 4.3% for all manpower covered, is expected to increase considerably during the next few years, owing in large part to the post-war increase in birth rate.

Items in the lower table show the several routes by which persons enter and leave science and engineering.

CHECKPOINT: 1960. *The foregoing historical perspective sketches the growth of manpower in science and technology during three decades. The following PROFILES examine in greater detail several distributions of this manpower for a single year, 1960, the most recent year for which comprehensive estimates now are available.*

1960

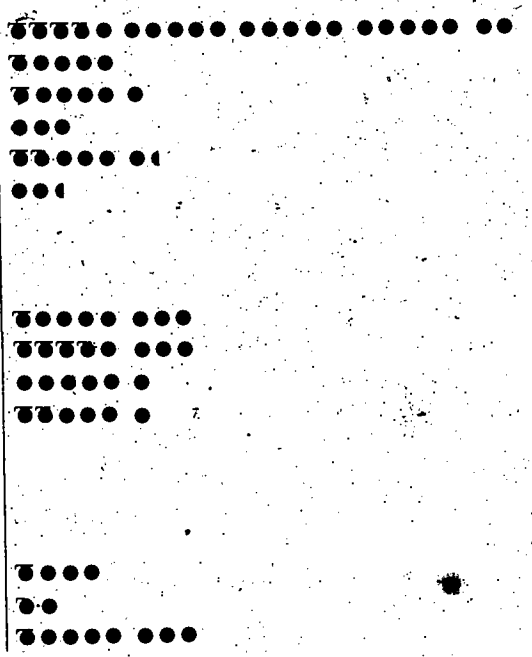
thousands

PERSONS WORKING AS	ALL	DOCTORAL
SCIENTISTS	435	81.7
PHYSICAL SCIENTISTS; MATHEMATICIANS	225	34.4
chemists	110	19.0
earth scientists	25	2.9
mathematicians	30	4.0
metallurgists	15	0.4
physicists	32	7.8
other physical scientists	13	0.3
LIFE SCIENTISTS INCLUDING PSYCHOLOGISTS	140	33.7
agricultural scientists	40	4.0
biological scientists	40	19.3
medical scientists	30	1.4
psychologists	30	9.0
SOCIAL SCIENTISTS	70	13.6
anthropologists	2	0.9
economists	20	5.7
sociologists	10	2.7
other social scientists	38	4.3

PROFILE BY FIELDS OF SPECIALIZATION

Physical, biological, and social phenomena are studied in many different ways, and the knowledge gained is applied to a wide variety of practical problems. Manpower in science and technology accordingly is divided into a number of specialties.

This PROFILE, continued on the next page, shows the 1960 distribution of scientific and technological manpower by fields of specialization.



Persons with M.D.s and other professional degrees are counted as medical scientists if they spend more time doing research than any other type of work; but they are counted in the doctoral column only if they also hold a Ph.D. or Sc.D.

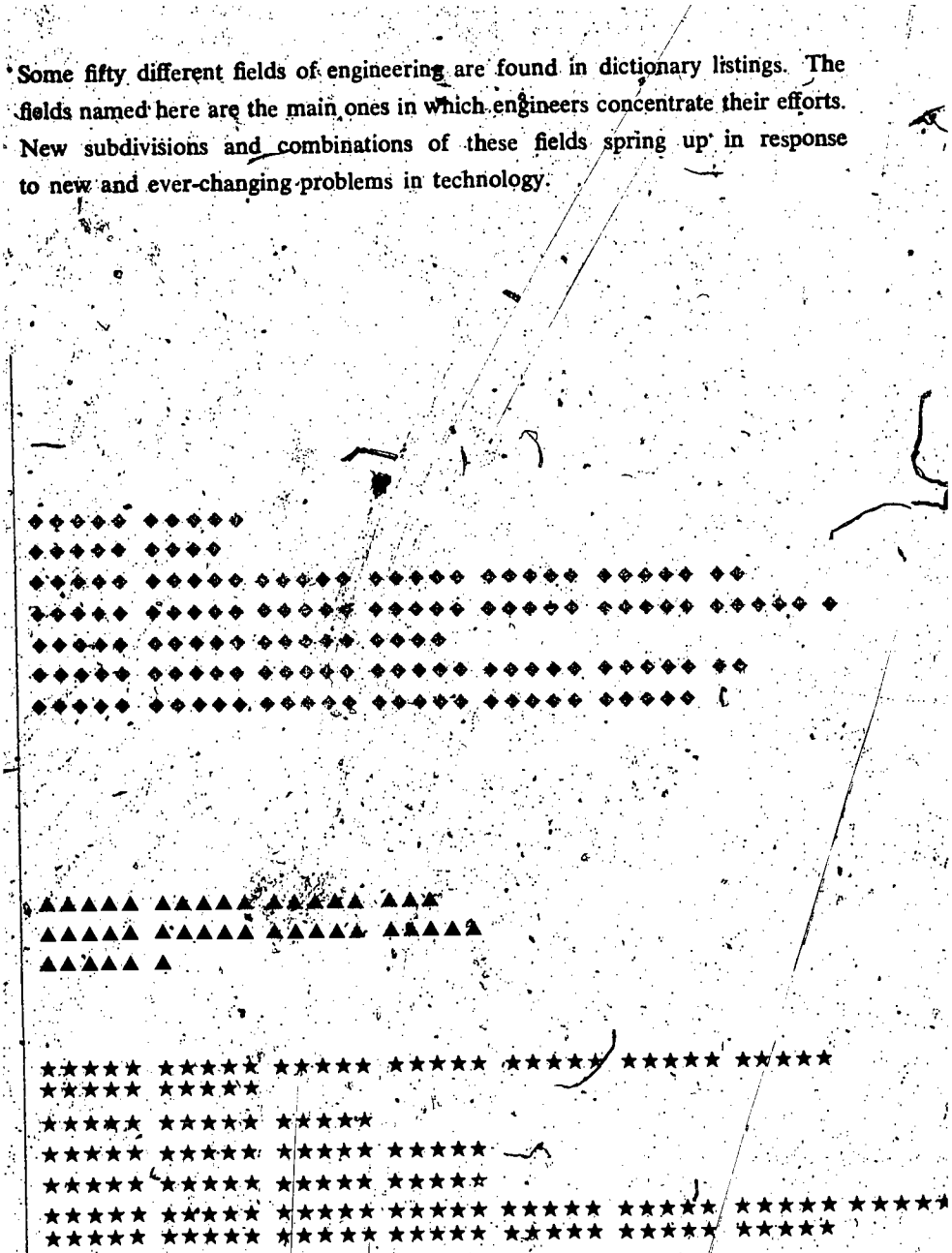
Psychologists are grouped in a single item, although their work ranges widely from experimental and biologically related psychology to social, clinical and educational psychology.

PROFILE BY FIELDS OF SPECIALIZATION, continued

1960 — thousands

PERSONS WORKING AS	ALL	DOCTORAL
ENGINEERS	840	7.5
aeronautical and astronautical engineers	50	0.7
chemical engineers	45	1.9
civil engineers	160	0.8
electrical engineers	180	2.6
industrial engineers	95	0.2
mechanical engineers	160	1.0
other engineers	150	0.3
SCIENTISTS AND ENGINEERS	1,275	89.2
TEACHERS OF SCIENCE AND MATHEMATICS IN SECONDARY SCHOOLS	220	2.0
teachers of science only	90	
teachers of mathematics only	100	
teachers of both	30	
TECHNICIANS	875	
draftsmen	225	
surveyors	75	
electronics technicians	100	
life sciences technicians	100	
other technicians	375	
ALL SPECIALIZED MANPOWER IN SCIENCE AND TECHNOLOGY	2,370	91.2

Some fifty different fields of engineering are found in dictionary listings. The fields named here are the main ones in which engineers concentrate their efforts. New subdivisions and combinations of these fields spring up in response to new and ever-changing problems in technology.



TEACHER SPECIALIZATION

Secondary school teachers of science and mathematics typically teach more than one subject. For example, a teacher of mathematics may also teach physics. Many of them teach only one course in science or mathematics, along with courses in non-science subjects.

In 1960 approximately forty thousand persons taught at least one secondary school course in biology, twenty-five thousand taught at least one in chemistry, sixty thousand in general science, twenty thousand in physics, and twenty-five thousand in other sciences. About fifty thousand persons taught at least one mathematics course in junior high school and about seventy-five thousand taught at least one mathematics course in senior high school.

About two thousand of these teachers hold doctor's degrees, most of which were awarded in fields other than science or mathematics.

Throughout these PROFILES, persons teaching science, mathematics, or engineering subjects in colleges and universities are defined as scientists or engineers.

PROFILE BY TYPES OF WORK

Varied and changing types of work characterize the activities of today's manpower in science and technology.

In colleges and universities, many members of the faculty divide their efforts between teaching and research, or between either or both of these activities and administration. In industry, a team of scientists and engineers as it evolves a new product or system may work first in research, then in development, then in production or operations:

The PROFILE on the next page outlines a static picture of this highly dynamic pattern of work. The figures estimate the numbers of scientists, engineers, and technicians, "primarily employed" in each type of work at a representative moment in 1960.

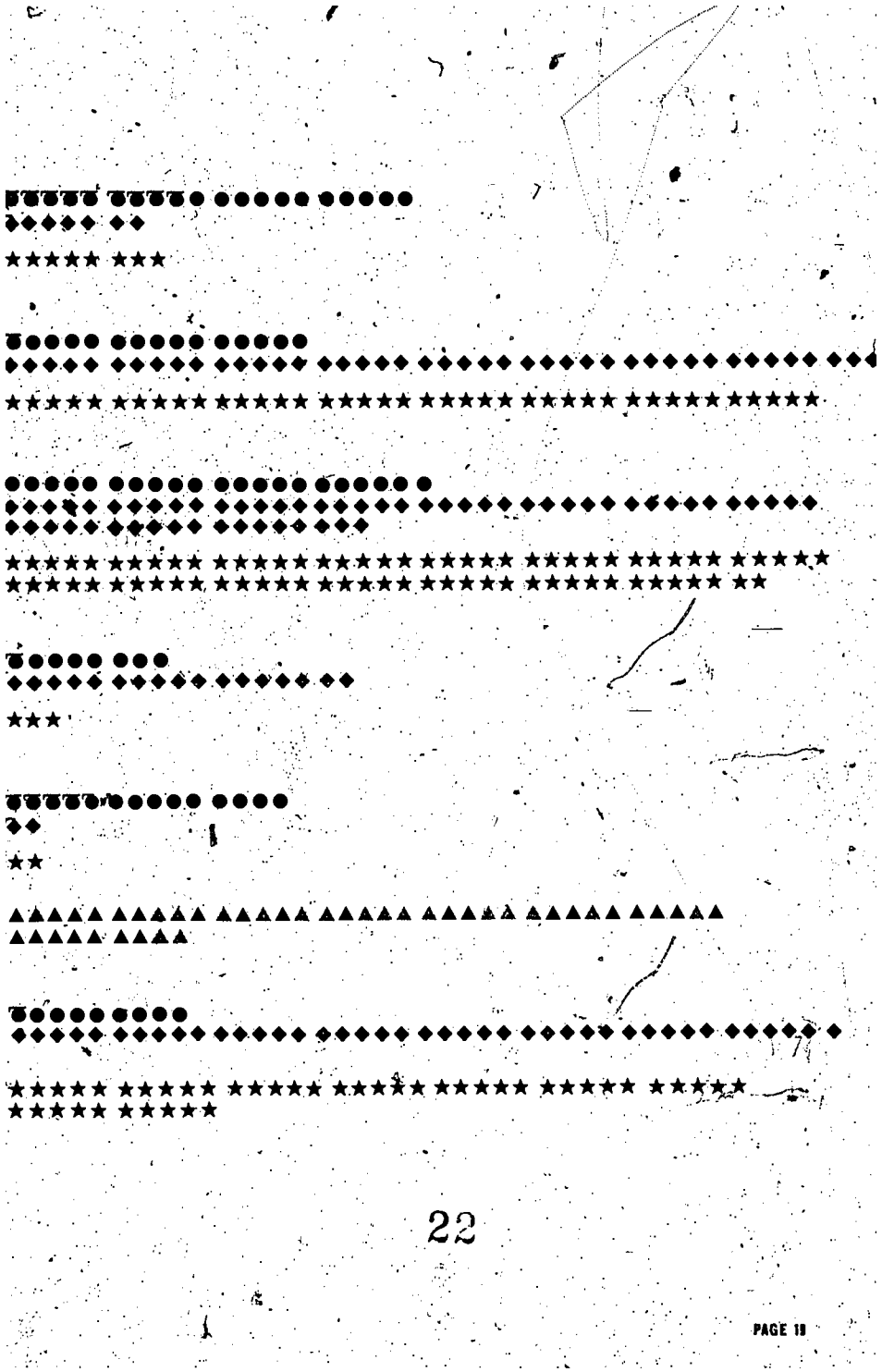
In these PROFILES, a person is counted as doing that type of work which engages more of his time than does any other type.

Work categories **research** and **development** include efforts devoted to administration and management of research and development, respectively. The separate category **administration, management** covers all other such efforts.

PROFILE BY TYPES OF WORK, continued

thousands

1960 PERSONS WORKING IN	ALL	DOCTORAL
RESEARCH	175	47.5
scientists	100	45.0
engineers	35	2.5
technicians	40	
DEVELOPMENT	490	6.0
scientists	75	5.5
engineers	215	0.5
technicians	200	
PRODUCTION, OPERATIONS	780	1.3
scientists	105	1.0
engineers	290	0.3
technicians	385	
ADMINISTRATION, MANAGEMENT	140	4.5
scientists	40	4.0
engineers	85	0.5
technicians	15	
TEACHING	310	28.5
scientists	70	23.0
engineers	10	3.5
technicians	10	
teachers of science and mathematics in secondary schools	220	2.0
OTHER WORK	475	3.4
scientists	45	3.2
engineers	205	0.2
technicians	225	
ALL SCIENTISTS AND ENGINEERS	1,275	89.2
ALL TECHNICIANS	875	
TEACHERS OF SCIENCE AND MATHEMATICS IN SECONDARY SCHOOLS	220	2.0
ALL SPECIALIZED MANPOWER IN SCIENCE AND TECHNOLOGY	2,370	91.2



EMPLOYMENT PROFILE BY SECTORS OF THE ECONOMY

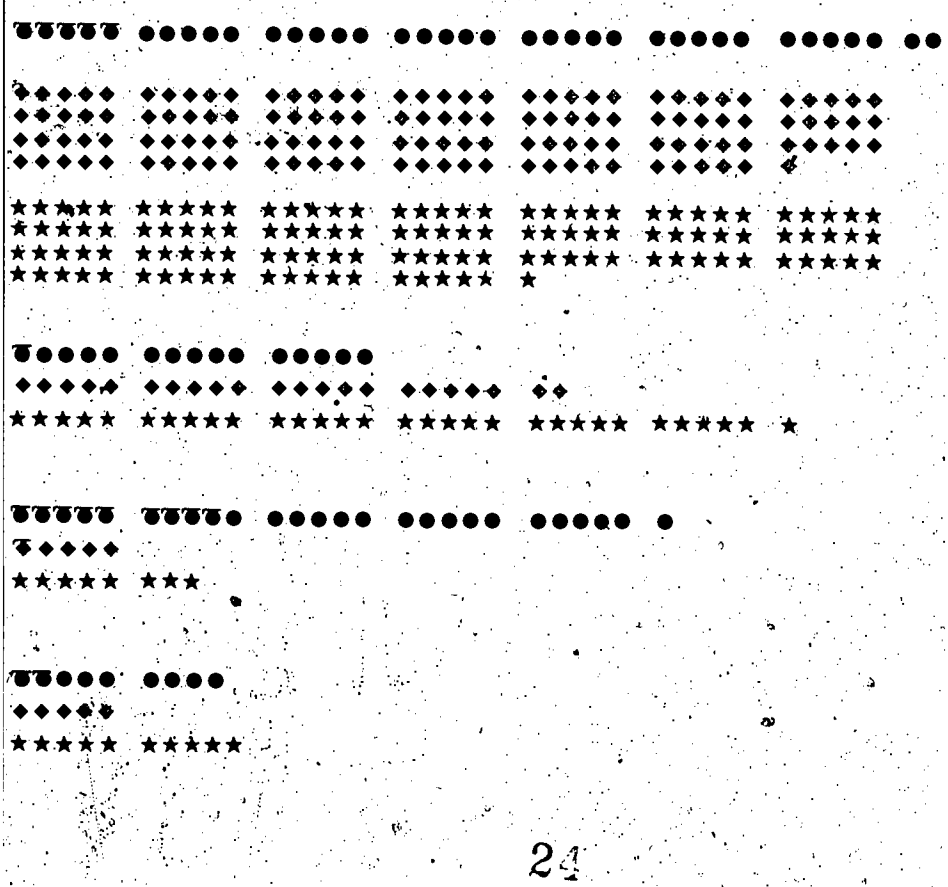
SCIENTISTS, ENGINEERS, TECHNICIANS 1960

Manpower also may be analyzed according to its employment distribution among sectors of the economy. One sector is industry, which includes all private, profit-making organizations.

PERSONS EMPLOYED BY	ALL	DOCTORAL
INDUSTRY	1,495	28.0
scientists	185	26.0
engineers	680	2.0
technicians	630	
FEDERAL, STATE, AND LOCAL GOVERNMENT	340	4.0
scientists	75	3.5
engineers	110	0.5
technicians	155	
COLLEGES AND UNIVERSITIES	195	50.4
scientists	130	46.0
engineers	25	4.4
technicians	40	
OTHER	120	6.8
scientists	45	6.2
engineers	25	0.6
technicians	50	
ALL SCIENTISTS AND ENGINEERS	1,275	85.2
ALL TECHNICIANS	875	

Public bodies at the Federal, State, and local level are grouped in the government sector. Colleges and universities, both public and private, are included in a third sector. Other institutions, such as foundations and independent research institutes, together with the self-employed are grouped in the last sector. The table below shows the numbers of scientists, engineers, and technicians working in 1960 in each of the four sectors, together with the number of scientists and engineers who hold doctoral degrees. Secondary school teachers, discussed in connection with fields of specialization, are omitted here.

thousands



RESEARCH

DEVELOPMENT

PRODUCTION, OPERATIONS

ADMINISTRATION, MANAGEMENT

TEACHING

OTHER

SCIENTISTS AND ENGINEERS DIVIDED BY TYPES OF WORK AND BY SECTORS

More than one-fourth of the Nation's scientists and engineers in 1960 were working primarily on production and operations within the industrial sector. About one-fifth were doing development work in industry and one-tenth were engaged primarily in research or in teaching within the colleges and universities sector.

Preceding tables consider scientists and engineers by the kinds of work they do and by the economic sectors in which they work. The two approaches are combined here to show about how many scientists and engineers in each sector were performing each type of work in 1960.

thousands

	INDUSTRY	GOVERNMENT*	COLLEGES AND UNIVERSITIES	OTHER
[redacted]	55	15	50	15
	240	40	5	5
	340	35	†	20
	75	30	10	10
	†	†	80	†
	155	65	10	20

*Federal, state, and local †Estimated less than one thousand

Percentage figures in this table indicate, for 1960, distributions of scientists and engineers working in research and development, according to the sector that supported their work and the sector in which they were employed.

1960

SCIENTISTS AND ENGINEERS WORKING IN RESEARCH AND DEVELOPMENT	EMPLOYED IN SECTOR	SUPPORTED BY SECTOR
INDUSTRY	75%	35%
GOVERNMENT	11%	62%
COLLEGES AND UNIVERSITIES	12%	2%
OTHER	2%	1%
ALL SECTORS	100%	100%

All sectors furnish dollars to support the work of scientists and engineers in research and development. Some of the dollars remain within the sector to support its own research and development and some flow to other sectors to support work done there.

Government, almost exclusively Federal, in 1960 paid for the work of about three-fifths of the Nation's scientists and engineers engaged in research and development, but most of these persons worked outside of the government.

These distributions are estimated on the full-time-equivalent basis illustrated on the next page.

Throughout this book figures for employment of scientists and engineers relate to persons "primarily employed," which means they spend at least one-half of their time in the employment specified. Because some scientists and engineers, especially in colleges and universities, divide their time among different types of work or employment, planners and policy makers sometimes need to use the alternative methods of counting manpower demonstrated here.

1960 thousands

SCIENTISTS AND ENGINEERS EMPLOYED IN COLLEGES AND UNIVERSITIES

	SCIENTISTS	ENGINEERS	TOTAL
NUMBER PRIMARILY EMPLOYED	130	25	155
TOTAL COUNT OF PERSONS	139	28	167
FULL-TIME-EQUIVALENT NUMBER	110	23	133
teaching	62	12	74
research and development	42	9	51
other work	6	2	8

Of the 155 thousand persons **primarily employed** as scientists and engineers in colleges and universities, about 109 thousand were employed full-time and 46 thousand part-time. However, another 12 thousand persons spent some, but less than one-half of their time doing similar work. Added together these numbers give a **total count** of about 167 thousand individual scientists and engineers. A third method of counting sums up all full-time and part-time efforts, measured in the proportion of time spent by each person on each type of work, and yields the **full-time-equivalent** number: the hypothetical number of full-time persons who would contribute the same total effort.

The last three lines of the table show how scientists and engineers employed in colleges and universities divided their time, in terms of full-time equivalents, among types of work.

AGE PROFILE

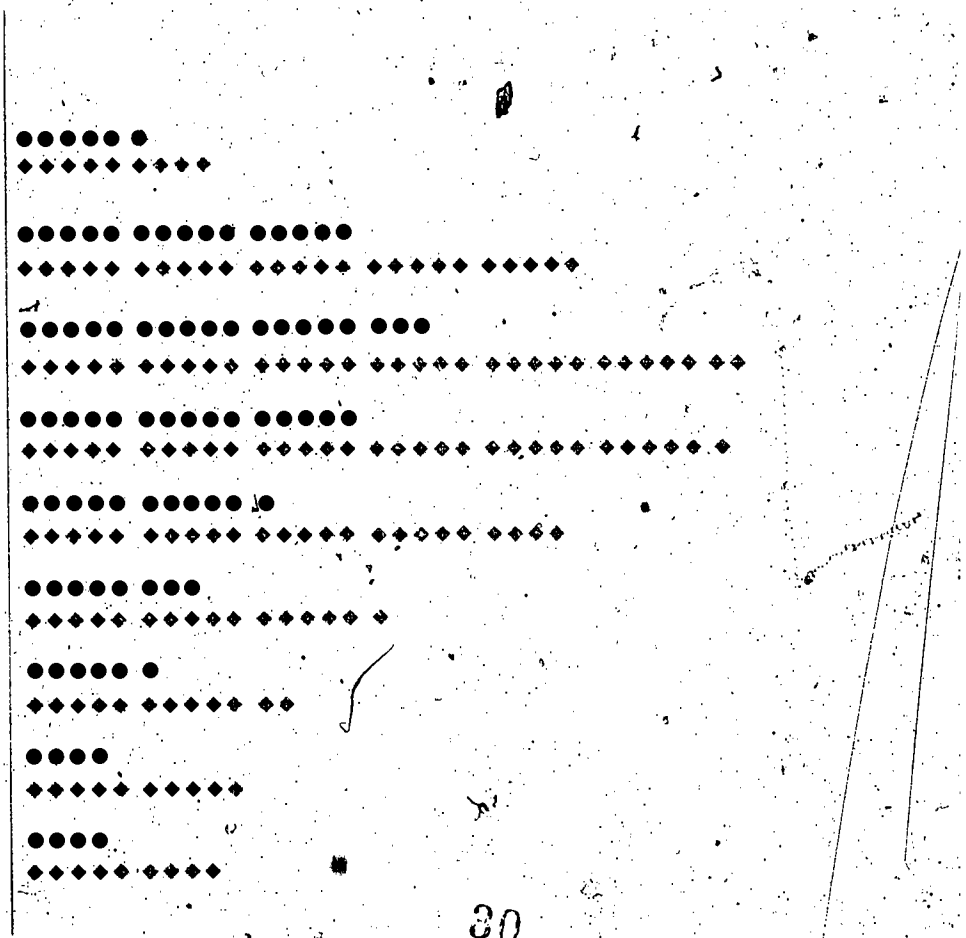
SCIENTISTS AND ENGINEERS 1960

thousands

AGE GROUP		NUMBER OF PERSONS IN EACH AGE GROUP
Under 25	scientists	30
	engineers	45
25-29	scientists	75
	engineers	125
30-34	scientists	90
	engineers	160
35-39	scientists	75
	engineers	155
40-44	scientists	55
	engineers	120
45-49	scientists	40
	engineers	80
50-54	scientists	30
	engineers	60
55-59	scientists	20
	engineers	50
over 59	scientists	20
	engineers	45
ALL SCIENTISTS AND ENGINEERS		1,275

The population of scientists and engineers is made up largely of persons in middle brackets of age. More than one half of them are over 29 but under 45, as this PROFILE shows.

Information given on the next page contrasts the age distribution of scientists and engineers with that of the labor force as a whole.



Because, as the historical perspective on page 6 shows, the average annual rate of growth in manpower is considerably higher for scientists and engineers than for the labor force, relatively fewer scientists and engineers are in older brackets of age. In 1960, for example, persons above age 54 accounted for 9 percent of all scientists and engineers, but nearly 18 percent of the labor force.

Scientists and engineers normally have attained a bachelor's degree, or the equivalent experience, and many have attained a master's or a doctoral degree. Average ages at receipt of these degrees range from 22 to 30. Consequently, the percent of persons under 25 years of age is smaller for scientists and engineers than for the entire labor force.

PERCENT OF MANPOWER IN EACH AGE GROUP

AGE GROUP	SCIENTISTS AND ENGINEERS		LABOR FORCE
	doctoral	all	
under 25	1.5	6.0	18.7
25-34	32.1	35.3	20.7
35-44	34.1	31.8	23.0
45-54	20.6	16.5	20.1
over 54	11.7	10.4	17.5
ALL AGES	100%	100%	100%

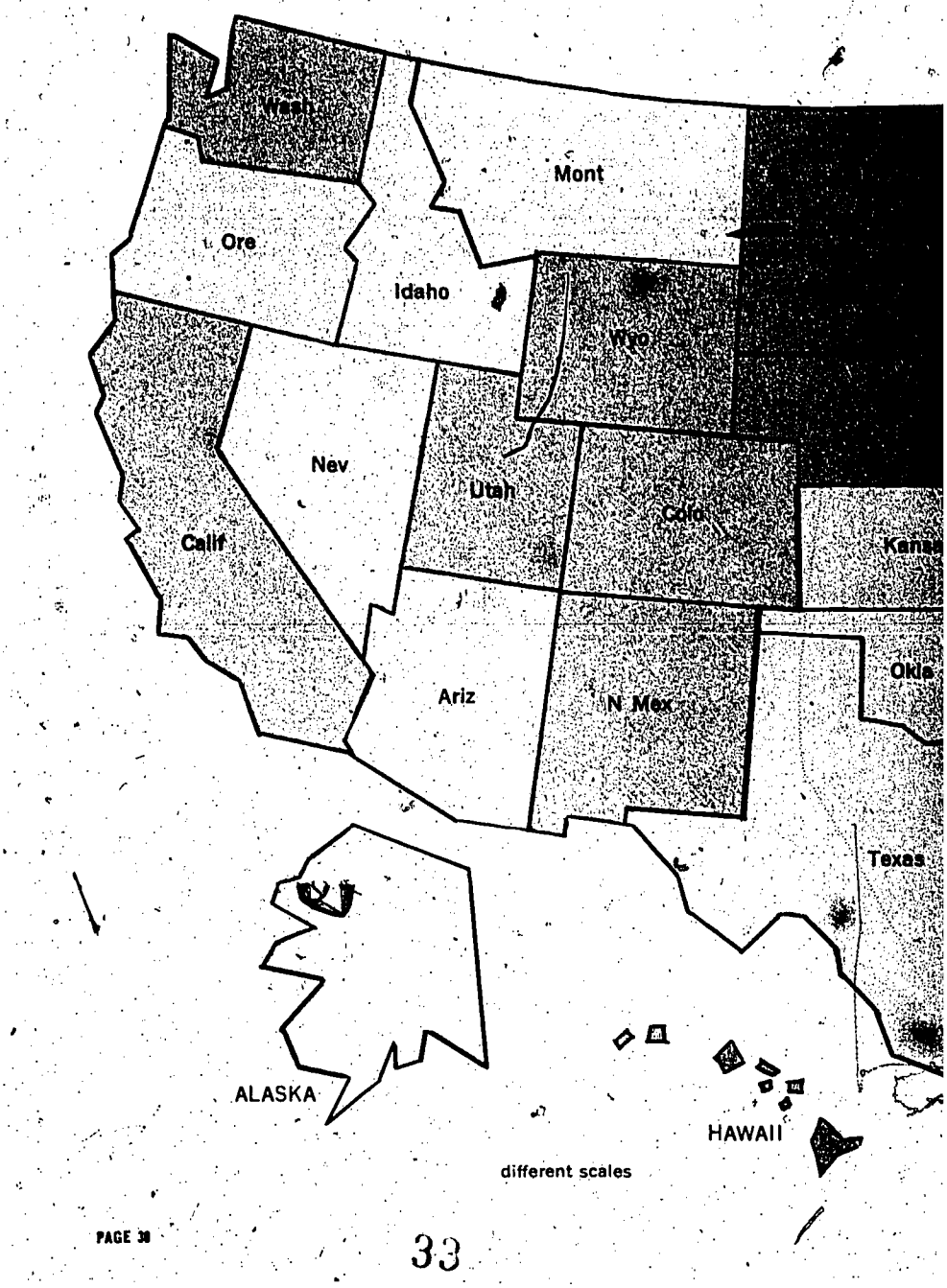
GEOGRAPHICAL PROFILE

SCIENTISTS AND ENGINEERS 1960

One half of the Nation's scientists and engineers work in six States, California, Illinois, New Jersey, New York, Ohio, and Pennsylvania. This concentration results in part from the large population of these States, which together contain about 40 percent of USA population and 40 percent of the labor force. In addition, however, these States rank high in the number of scientists and engineers as a proportion of all persons employed.

According to estimates for 1960, scientists and engineers together make up about 1.8 percent of the Nation's labor force. On this percent scale individual States differ by a factor of nearly eight, from 0.6 to 4.6 percent of the labor force, signifying a wide range of emphasis on scientific and technological activity.

The map on the following pages shows the States divided into four groups according to percent of labor force working as scientists and as engineers.


Wash
Mont
Ore
Idaho
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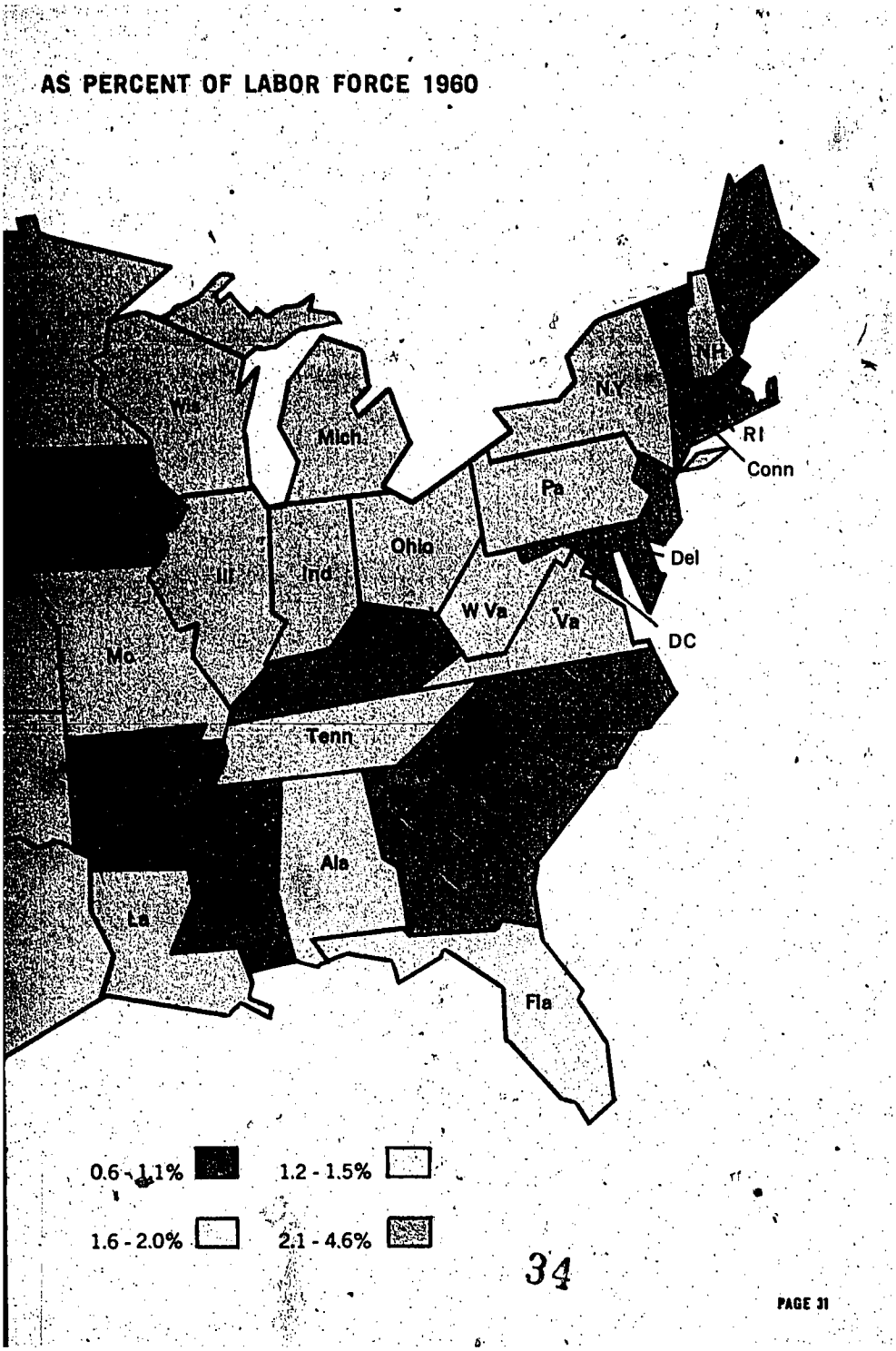
Nev
Utah
Colo
Calif
Kansas
Ariz
N Mex
Okla
Texas
ALASKA
HAWAII
different scales


AS PERCENT OF LABOR FORCE 1960
Wis
Mich
NY
NH
RI
Conn
Pa
Ohio
Ind
Ill
Del
W Va
Va
DC
Mo
Tenn
Ala
La
Fla
0.6 - 1.1%
1.2 - 1.5%
1.6 - 2.0%
2.1 - 4.6%

This table gives numbers of scientists and engineers in thousands and as a percent of the labor force for each State. Less populous States may show high percentages of scientists and engineers owing to low populations rather than to significantly high concentrations of scientists and engineers.

	SCIENTISTS		ENGINEERS	
	thousands	percent of labor force	thousands	percent of labor force
ALL STATES	435	0.6%	840	1.2%
Alabama	3.1	0.3%	10.9	0.9%
Alaska	0.9	0.9%	0.8	0.8%
Arizona	3.1	0.7%	5.0	1.1%
Arkansas	1.3	0.2%	2.5	0.4%
California	50.1	0.8%	122.7	1.9%
Colorado	7.5	1.1%	9.2	1.4%
Connecticut	8.4	0.8%	19.3	1.8%
Delaware	4.8	2.7%	3.4	1.9%
D. C.	13.5	3.7%	3.4	0.9%
Florida	7.0	0.4%	16.0	0.8%
Georgia	4.4	0.3%	10.9	0.7%
Hawaii	0.9	0.3%	1.7	0.6%
Idaho	1.3	0.5%	1.7	0.7%
Illinois	24.5	0.6%	51.2	1.2%
Indiana	8.8	0.5%	20.2	1.1%
Iowa	4.4	0.4%	6.7	0.6%
Kansas	4.4	0.5%	10.1	1.2%
Kentucky	2.6	0.3%	6.7	0.6%
Louisiana	6.6	0.6%	8.4	0.8%
Maine	0.9	0.3%	2.5	0.7%
Maryland	16.2	1.3%	21.8	1.8%
Massachusetts	17.5	0.8%	32.8	1.5%

	SCIENTISTS		ENGINEERS	
Michigan	15.8	0.5%	42.8	1.5%
Minnesota	7.5	0.6%	12.6	1.0%
Mississippi	1.8	0.2%	3.4	0.5%
Missouri	7.9	0.5%	15.1	0.9%
Montana	1.8	0.7%	1.7	0.7%
Nebraska	1.8	0.3%	3.4	0.6%
Nevada	0.9	0.7%	0.8	0.7%
New Hampshire	0.9	0.4%	2.5	1.0%
New Jersey	23.6	0.9%	45.4	1.8%
New Mexico	4.4	1.3%	5.0	1.5%
New York	53.1	0.8%	85.7	1.2%
North Carolina	5.3	0.3%	8.4	0.5%
North Dakota	0.9	0.4%	0.8	0.4%
Ohio	20.4	0.5%	53.8	1.4%
Oklahoma	6.2	0.7%	8.4	1.0%
Oregon	4.8	0.7%	5.9	0.9%
Pennsylvania	25.2	0.6%	52.1	1.2%
Rhode Island	1.3	0.4%	3.4	0.9%
South Carolina	1.8	0.2%	4.2	0.5%
South Dakota	0.9	0.4%	0.8	0.3%
Tennessee	6.2	0.5%	10.1	0.8%
Texas	20.4	0.6%	39.5	1.1%
Utah	3.5	1.1%	5.0	1.6%
Vermont	0.9	0.6%	0.8	0.5%
Virginia	6.6	0.4%	17.6	1.2%
Washington	7.5	0.7%	20.2	1.8%
West Virginia	2.6	0.4%	5.0	0.9%
Wisconsin	7.5	0.5%	16.0	1.0%
Wyoming	1.3	1.0%	1.7	1.3%

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PRIMARY SOURCES OF ADDITIONAL DATA

Designed specifically to sketch the totality of national specialized manpower in science and technology, these PROFILES unavoidably sacrifice detail and precision. Many pieces of the statistical picture are developed in greater detail in publications cited here. They contain, as annotations indicate, explanations of concepts, definitions, and data that supplement the information presented in this book.

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June, 1963

The National Science Foundation serves a focal role in the providing of statistical data on scientific and technical personnel and concerns itself also with uses of such data in the forming of national policy for science.

Toward further fulfillment of these responsibilities, PROFILES offers a national summary, in broad categories, of numbers of persons working as specialists in science and technology. The book is evidence of the outstanding cooperation obtained from individuals at all levels of those organizations, both public and private, which gathered and made available the data reflected here.

Within the Foundation, PROFILES was developed by the Associate Director (Planning) and Head of the Science Resources Planning Office, Richard H. Bolt, as a joint project of the Science Resources Planning Office, the Scientific Personnel and Education Studies Section, and the Office of Economic and Statistical Studies, with the assistance of the Office of Public Information.

The Foundation hopes that this volume, besides contributing summary statistics needed for planning and policy making, will encourage increased efforts and interest in the development of manpower information essential to the guidance of the Nation's science and technology.

ALAN T. WATERMAN
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